CLAIMS

1. Use in the treatment of metal substrata and their alloys, of mono- and bifunctional (per)fluoropolyether compounds having the following structures:

$[R_f\text{-}CFY\text{-}L\text{-}O]_mP(O)(O^-Z^+)_{3-m}$ (A)

$(O^-Z^+)_2P(O)[O\text{-}L\text{-}YFC\text{-}O\text{-}R_f\text{-}CFY\text{-}L\text{-}O\text{-}P(O)(O^-Z^+)]_{m'}$-

-$[O\text{-}L\text{-}YFC\text{-}O\text{-}R_f\text{-}CFY\text{-}L\text{-}O]P(O)(O^-Z^+)_2$ (B)

$R_f\text{-}CFY\text{-}L\text{-}W$ (C)

$W\text{-}L\text{-}YFC\text{-}O\text{-}R_f\text{-}CFY\text{-}L\text{-}W$ (D)

wherein:

m' is an integer from 0 to 20, preferably from 0 to 4;

L is an organic group selected from $-CH_2-(OCH_2CH_2)_n-$, $-CO-NR'-(CH_2)_q-$, with R' = H or C_1-C_4 alkyl;

n = 0-8, preferably 1-3, q = 1-8, preferably 1-3;

Z = H, alkaline metal or NR_4 group with R = H or C_1-C_4 alkyl; Y = F, CF_3;

m = 1, 2, 3, preferably 1, 2;

W is a group $-Si(R_1)_\alpha(OR_2)_{3-\alpha}$ with α = 0, 1, 2, R_1 and R_2 equal to or different from each other are C_1-C_6 alkyl groups optionally containing one or more ether O, C_6-C_{10} aryl groups, C_7-C_{12} alkyl-aryl or aryl-alkyl groups;

Rf has a number average molecular weight in the range 350-8,000, preferably 500-3,000 and comprises repeating units having at least one of the following structures,

statistically placed along the chain:

($CFXO$), (CF_2CF_2O), ($CF_2CF_2CF_2O$), ($CF_2CF_2CF_2CF_2O$),

($CR_4R_5CF_2CF_2O$), ($CF(CF_3)CF_2O$), ($CF_2CF(CF_3)O$),

wherein

X = F, CF_3;

R_4 and R_5, equal to or different from each other, are selected from H, Cl, or perfluoroalkyl having from 1 to 4 carbon atoms.

2. Use in the treatment of metal substrata according to claim 1, wherein Rf is selected from the following structures:

1) $-(CF_2O)_{a'}-(CF_2CF_2O)_{b'}-$

with a'/b' in the range 0.5-2, extremes included, a' and b' being integers such as to give the above molecular weight;

2) $-(C_3F_6O)_r-(C_2F_4O)_b-(CFXO)_t-$

with r/b = 0.5-2.0; (r+b)/t is comprised between 10-30, b, r and t being integers such as to give the above molecular weight, X has the above meaning;

3) $-(C_3F_6O)_{r'}-(CFXO)_{t'}-$

t' can be 0;

when t' is different from 0 then r'/t' = 10-30, r' and t' being integers such as to give the above molecular weight; X has the above meaning;

4) $-(OCF_2CF(CF_3))_z-OCF_2(R'f)_y-CF_2O-(CF(CF_3)CF_2O)_z-$

wherein z is an integer such that the molecular weight is the above one;

y is an integer between 0 and 1 and R'f is a fluoroalkylene group having for example 1-4 carbon atoms;

5) $-(OCF_2CF_2CR_4R_5)_q-OCF_2(R'f)_y-CF_2O-(CR_4R_5CF_2CF_2O)_s-$

wherein:

q and s are integers such that the molecular weight is the above one;

R_4, R_5, R'f, y have the above meaning;

6) $-(C_3F_6O)_{r'''}-(CFXO)_{t'''}-OCF_2(R'f)_y-CF_2O(CF(CF_3)CF_2O)_{r'''}-(CFXO)_{t'''}-$

wherein r'''/t''' = 10-30,

r''' and t''' being integers such as to give the above molecular weight;

R'f and y having the above meaning.

3. Use in the treatment of metal substrata according to claims 1-2, wherein in the compounds of structure (A) and (C) the end group of R_f is of the T-O- type, wherein T is a (per)fluoroalkyl group selected from: $-CF_3$, $-C_2F_5$, $-C_3F_7$, $-CF_2Cl$, $-C_2F_4Cl$, $-C_3F_6Cl$; optionally one or two F atoms, preferably one, can be substituted by H.

4. Use in the treatment of metal substrata according to claims 1-3, wherein a mixture of compounds (C) and (D) is

used.

5. Use in the treatment of metal substrata according to claims 1-4, wherein the treatment is made by dipping, spin-coating, spraying, padding or brushing.

6. Use in the treatment of metal substrata according to claims 1-5, wherein the perfluoropolyether compounds of structure (C) and (D) are applied using formulations with solvent, solvent-water mixtures or prevailingly aqueous formulations.

7. Use in the treatment of metal substrata according to claim 6, wherein the concentration of the perfluoropolyether compounds of structure (C) and (D) in the formulation is in the range 0.01-15% by weight, preferably 0.1-5% by weight.

8. Use in the treatment of metal substrata according to claims 1-5, wherein the perfluoropolyether compounds of structure (A) and (B) are applied using aqueous formulations or formulations having a polar solvent.

9. Use in the treatment of metal substrata according to claim 8, wherein the formulation contains an amount by weight of perfluoropolyether compound of structure (A) and (B) in the range 0.1-10% by weight, preferably 0.5-5%.

10. Use in the treatment of metal substrata and their alloys

to confer anti-corrosive properties of the mono- and bi-functional (per)fluoropolyether compounds of claims 1-9.

11. Use according to claim 10, wherein the perfluoropolyether compounds have structure (C) and (D).